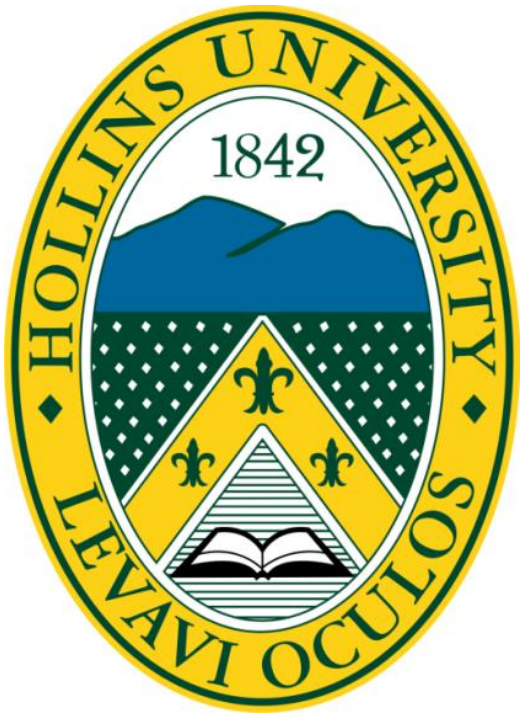
Hollins University



61st Annual Science Seminar

Thursday, April 26th

4:30-6:00 p.m. Ballator Gallery

We are pleased to have you join us as we celebrate the research conducted by science and mathematics students at Hollins University during the 2017-2018 academic year. In this program, you will find abstracts for the 18 research projects that are highlighted at this poster session. This, collectively, represents the work of 23 Hollins science students.

We encourage you to chat with our students during this poster session. They are eager to talk to you about their research and to answer any questions you may have. Posters will be up by 4:00 and students will be available from 4:30-6:00 p.m.

Light refreshments will be provided

Research Abstracts by Department

Department of Biology &
Department of Environmental Studies

Pre-hurricane rebound of critically endangered *Acropora palmata* in St. John, U.S. Virgin Islands

Natasha Bestrom
Under the direction Dr. Renee Godard

Evidence suggests that *Acropora palmata* populations have not recovered from the rapid decline this species experienced during the 1980s and, despite protection, data suggest that some populations have continued to decline over the last twenty years. In contrast, populations of *A. palmata* in St. John, USVI have exhibited some signs of a slow recovery between 2001 and 2010, despite the mass-bleaching event of 2005. This study sought to determine the status of *A. palmata* populations and to evaluate factors (i.e. disease, corallivores, proximity to seagrass meadows) that may be relevant to its future success. There was a significant increase in the density of *A. palmata* in resurveyed sites between 2004 and 2017 (9 sites) and between 2010 and 2017 (8 sites). Colony density in resurveyed sites increased by more than 45% from 2010 and by more than 120% from 2004, despite the fact that there was a decline in *A. palmata* density at two of the resurveyed sites. While active coral disease and predation were evident at all sites, significantly more healthy *A. palmata* colonies (i.e. more than 90% tissue coverage) were found at sites adjacent to seagrass meadows when compared to those colonies in sites that lacked neighboring seagrass meadows. The positively skewed size distribution and increasing density suggest that this population may possess resilient properties that have not been found in other regions of the Caribbean. The response of this population to the two category 5 Hurricanes (Irma and Maria) which hit two months after the 2017 survey may be instructive in understanding how this species will fare in the future under climate change.

Baseline Study of Fish Abundance and Species Richness of the Wetland Area in Banteay Srei District

Goma Karki
Under the direction of Dr. Megan White
SFS Cambodia Program

Wetlands comprise 30% of ecosystems in Cambodia and four of these are internationally significant because of their high species diversity. We conducted a baseline study of fish abundance and species richness with a focus on variation in diurnal and nocturnal fish catch at Boeung Chuk lake in Banteay Srei District in Siem Reap Province. Fish were caught using 2.5 cm and 3.5 cm mesh gill nets in the morning and evening from April 17 to April 28, 2017. In addition, seven interviews were conducted with local fishing families to help compile a more complete list of fish biodiversity. We sampled a total of 833 fish, representing 13 species from 6 different families and found significantly higher catch rates during nocturnal sampling. *Cyclocheilichthys apogon* and *Pristolepis fasciata* were the two most abundant species representing 89 percent of the total species abundance. We also added 15 new species to the previously identified taxonomic list from our samples and interviews. This information can be used to inform future research on comparative analyses comparing species richness and abundance seasonally, inter-annually and as the site undergoes development changes.

The role of edge effects in emerald ash borer infestation dynamics and forest regeneration

Catherine Kirkpatrick
Under the direction of Dr. Elizabeth Gleim

Agrilus planipennis, or emerald ash borer (EAB), is a non-native, invasive beetle first detected in the United States in 2002. EAB feeds on and kills all native ash tree species in the U.S. and since its introduction has spread throughout most of the eastern U.S. In 2015, it was first detected in Roanoke. Our work aims to document the loss of ash trees in the Roanoke Valley and in particular, determine the role that edge effects play in infestation dynamics and how forests regenerate post-EAB. In particular, we hope to determine whether ash trees along the edge are more susceptible to infestation and/or whether they decline more rapidly once infested. We also plan to document which species replace dead ash trees and whether invasive species are more likely to replace ash trees lost in the edge versus the core of the forest. In the summer of 2017, we established 12 sites along forest edges, 6 sites had ash trees and 6 sites served as controls and did not have ash trees. At each site we established 2-3, 10 x 50m belt transects. Within each transect we identified all species of trees greater than 2.5 cm diameter at breast height (dbh), measured their dbh, and their location within the transect. For ash trees, we also scored their health status. Finally, we also evaluated species composition and size of seedlings within microplots within each transect. We found that ash trees showed varying levels of health both by site and within a site. Using a whole number scale from 1-5, the average health scores of ash trees ranged from 1.7 +/- 0.76 to 3.2 +/- 0.32 by site with 1 being completely healthy and 5 being dead. The fact that all sites still had some healthy ash trees indicates that we will likely be poised to track the infestation and death of ash trees at these sites and forest responses in the years to come. Ultimately, the data collected this past summer will serve as baseline data for long-term monitoring.

Protein-protein Interaction Between Connexin 43 and PIK3CB/p110beta in Glioblastoma

Gabrielle Lewis
Under the direction of Dr. Zhi Sheng
Virginia Tech Carilion Research Institute

Glioblastoma (GBM) is the most lethal and the most common form of brain cancer [1]. With a five year survival rate of approximately 5% [1] and as many as 90% of patients developing recurrent tumors [2], those diagnosed with GBM face a grim reality, even in the face of aggressive treatments. It is not currently known what causes GBM to form or what makes it grow so rapidly. Understanding the growth mechanism of the cells could give some insight into how the tumor grows, and more importantly, how to slow or stop the growth. A consideration is the PI3K signaling pathway responsible for survival and proliferation in some cancer cells [3]. Another consideration is connexin 43 (Cx43), a gap junction protein that aides in regulation and proliferation of both healthy and cancerous cells [4]. While Cx43 plays a role in numerous other forms of cancer, its specific role in glioblastoma remains unknown and to be investigated. It was hypothesized that Cx43 would interact with a PI3K protein to activate the downstream AKT growth pathway. With the use of immunoprecipitation and immunoblotting, it was found that Cx43 was present when the PI3K protein p110β was selected for in the experiment. These results indicate that there is a protein- protein interaction between Cx43 and p110β in U87MG glioblastoma cells.

Economic and Ecological Benefits of Oysters in the Chesapeake Bay: An Optimal Harvest Management Tool

Lan Nguyen
Under the direction of Drs. Renee Godard, Pablo Hernandez and Emese Kennedy

This study investigated the optimal harvest policy that would maximize the total social welfare of the Chesapeake Bay provided by oyster-related coastal activities, which involve trade-offs among different categories of values from ecosystem services, including food production, ecosystem regulation, and recreational and aesthetic uses. Adopting the oyster bioeconomic model developed from DePiper et al. (2017), this study incorporated the economic values from coastal uses including wild oyster harvesting, oyster farming, nitrogen removal services, and recreational activities using a benefit transfer approach. Simulation results from the optimization model suggested that the optimal path for the harvest rate of wild oyster populations should allow a population level to be reach half of the carrying capacity. When the willingness to pay for recreation activities increases, the optimal allocation to shellfish aquaculture declines. This study discerned the key role of nitrogen credits, correct nitrogen pricing policy, and willingness to pay for recreational activities in restoring and maintaining the oyster populations.

The Hollins Tree Inventory: Analyzing our trees & quantifying the impacts of the emerald ash borer on campus

Caitlyn Abare, Chelsea Alley, Ellie Bunten, Jyoti Thapa, Samantha Viner*
Under the direction of Dr. Elizabeth Gleim

Tree inventories are an important tool for valuing economic and ecological benefits of trees in a given area and are also critical to making evidence-based management plans. Performing a tree inventory on the Hollins campus was especially pertinent given the detection of the emerald ash borer (EAB) on campus last year. EAB is a non-native forest pest that has killed tens of millions of native ash trees in the eastern United States. This semester, Bio/ES 357: Conservation Biology worked to expand a tree inventory initiated by last year's class in order cover almost the entire core campus and the full length of Carvin's Creek visible from the loop. In addition to identifying trees, basic structural measurements, GPS coordinates, and EAB presence/ absence were measured. Ecosystem services provided by the trees were also calculated & a map of all trees on campus is in the process of being made. In total, 507 trees have been surveyed on campus and 129 trees were surveyed by the creek. Ash trees made up over 60% of the trees along the creek and 8.7% of our trees in the core of campus. Ashes also stored the most carbon and contributed the most towards storm water runoff prevention. All ash trees along the creek showed probable &/or confirmed signs of EAB with several untreated trees on campus potentially showing early signs of EAB infestation. Furthermore, the majority of our ash trees in the core of campus are reaching the end of their natural life span (unrelated to EAB). While it is unclear how much longer uninfested ash trees in the core of campus might live, all ash trees along the creek will likely be lost in 1-3 years. Thus, it is prudent that Hollins plan for the future as we prepare to lose a large number of trees.
***presenter**

Antibiotic resistance in cave microbial communities that vary in exposure to human recreational activity

Maya Sproelich
Under the direction of Drs. Carmichael and Derringer

Within nutrient poor environments such as caves, species within microbial communities must compete with one another to obtain scarce nutrients that are vital for cellular processes. Some microorganisms produce antibiotics to compete for survival in nutrient limited environments, while others evolve mechanisms of resistance against the chemical assault of antibiotics in an evolutionary arms race. Soil samples were collected from James Cave in Radford, Virginia, and then cultured using a variety of media to select isolates which were tested against specific antibiotics. Zones of inhibition were measured for each disk on the disk diffusion plates and averages were calculated for various combinations of antibiotics, location, and isolate. It was found that the resistance between gram positive and gram negative bacteria varied in the less trafficked areas in comparison to the more trafficked areas.

The Effect of Environmental Factors on Endoparasite Load and Diversity in Black Capped Night Monkeys (*Aotus Nigriceps*)

Katlin Gott
Under the Direction of Dr. William Helenbrook, School For Field Studies,
Center for Amazon Studies, Urubamba, Peru and Pilcopata, Peru

The purpose of this research was to determine how environmental and social factors affect parasite load and diversity in Black-Capped Night monkeys (*Aotus nigriceps*). This socially monogamous species lives in small family groups distributed throughout the central and northern Amazon basin, in both primary and secondary forests. These primates regularly host gut parasites from the genera *Strongyloides Necator* and *Enterobius*. As these monkeys often live very close to human populations, there is concern for zoonotic transmission of parasites to humans. Groups of monkeys at two different sites were observed, and fecal samples were collected from nets that had been laid on the forest floor beneath the monkeys' nesting sites. We hypothesized that higher levels of anthropogenic disturbance, distance from human settlements, and larger social groups would all increase the endoparasite loads of *Aotus nigriceps. Small sample sizes prohibited analysis of how primary and secondary forest habitats affect parasite species diversity.* However, our data show a significant negative relationship between endoparasite diversity and family group size ($r^2 = 0.964$, $p = 0.041$) and also between parasite diversity and forest density (expressed as basal area; $r^2 = 0.986$, $p= 0.0081$). Our results suggest that human disturbance significantly increases parasite species diversity based on the changes in forest density. Future research will focus on determining if the degree of forest disturbance plays a role in these relationships, and if zoonotic transmission of parasites between humans and the Black-capped Night monkeys is occurring.

Department of Chemistry

Effect of a Novel Connexin43 Mimetic Peptide on Microtubule Dynamics in Glioma Stem Cells

Veronica Able-Thomas
Under the direction of Drs. Laurie O'Rourke, James W. Smyth, Samy Lamouille
Heart and Regenerative Medicine, Virginia Tech Carillion Research Institute, Roanoke, VA

Glioblastoma (GBM) is a lethal brain tumor accounting for the highest number of cases of all malignant brain tumors. The American brain tumor association estimates that a median survival time is 14.6 months with current treatments including surgical resection, radiotherapy and chemotherapy with temozolomide (TMZ). GBM tumors encompass a mix of cell types including glioma stem cells (GSC) which are TMZ resistant. Recent studies demonstrated that GSC TMZ resistance correlates with expression of Connexin43 (Cx43), a gap junction protein. Regulation of Cx43 localization and activity is associated with the multiple sites for protein-protein interaction within the Cx43 carboxy-terminus (CT) where a tubulin binding domain also occurs. Our previous research has found that the Cx43 mimetic peptide, JM2, which mimics the region of the CT of Cx43 that binds to tubulin, inhibits GSC migration. We hypothesize that JM2-induced inhibition in cell migration is partly due to JM2 affecting microtubule dynamics in GSCs. To test this hypothesis, we overexpressed EB1 (a microtubule associated protein) and tubulin GFP fusion proteins in GSCs and treated the cells with JM2, JM2-scrambled (a control peptide) or neither. Tracking of microtubule dynamics was then examined using confocal microscopy and analyzed using computing software. Our results show that cells expressing tubulin GFP proteins and treated with JM2 have reduced growth and higher shortening velocities than the controls, indicating that JM2 affects microtubule dynamics in GSCs. These data reveal a novel approach for targeting GSCs through alternating Cx43 function, and may contribute to the development of novel GBM therapeutics.

NMR Signal Assignment in cis-Re2(O2CCH3)2Cl2(dppm)2

Sarah Struble
Under the direction of Dr. Daniel Derringer

The NMR spectrum of cis-Re2(O2CCH3)2Cl2(dppm)2 shows two signals that correspond to the pairs of equivalent hydrogen atoms on the methylene carbons of the dppm groups. In order to determine which pair of hydrogen atoms gives rise to each signal, both experimental and theoretical approaches were used. The experimental approach involves the synthesis of a ligand with the formula dppmX, which can then be used to synthesize cis-Re2(O2CCH3)2Cl2(dppmX)2, which would contain only one of the equivalent hydrogen pairs of interest. To determine theoretically which signal should arise from each pair of hydrogen atoms, the diamagnetic anisotropic effects on these hydrogens resulting from the Re–Re triple bond and the phenyl groups of dppm were estimated using mathematical models described previously in the literature. The ligand dppmCN was successfully synthesized, though not in high enough yield to allow for the synthesis of cis-Re2(O2CCH3)2Cl2(dppmCN)2.

Synthesis of dppmCN and its role in assigning chemical shifts to certain hydrogen atoms of compounds containing pairs of dppm ligands

Rania Asif

Under the direction of Dr. Daniel Derringer

The compound bis(diphenylphosphino)acetonitrile (dppmCN) was synthesized by modifying some of the procedural details of a method described in the literature. Instead of using butyl lithium as a base in the synthesis, we used lithium diisopropylamide. The yield of dppmCN was poor, mainly because of the presence of water in the reaction mixture. Water brings about undesirable side reactions, and it was difficult for us to exclude. Additionally, a database of chemical shift values was created. The values were found in the literature, and they are of protons in the methylene bridge between the phosphorus atoms of compounds containing bis(diphenylphosphino)methane (dppm). These values are important to us, because they may help us to assign resonances in compounds of dirhenium(II) that contain pairs of dppm.

Department of Mathematics

Pythagoras and Music
Mary Hess
Under the direction of Dr. Emese Kennedy

In this project, we investigate Pythagoras' influence on the study of music. More specifically, we explore how Pythagoras created his own intervals, and how his research relates to the ratios that make up harmonies between notes. We also discuss Pythagoras' legacy and how his work affects musicians today.

A Preliminary Analysis of the Impacts of Hurricanes Irma and Maria on Fish Assemblages in St. John, USVI
Goma Karki
Under the direction of Drs. Julie Clark and Renee Godard

While Caribbean ecosystems are adapted to hurricanes, global climate change is likely to result in increasing intensity of hurricanes which is likely to have impacts on population abundance and diversity of organisms. Data on fish biodiversity and abundance was collected at seven reef and three mangrove sites in St. John, USVI as part of a research course in January of 2016 and 2017. Following Hurricanes Irma and Maria, data on fish was collected again in 2018. This work represents a preliminary analysis on the impacts of the hurricane on fish abundance and biodiversity. No large scale changes in fish abundance or biodiversity was noted, however, at least one specialist feeder, Queen Angelfish, showed decline at most sites.

Predicting the Net Hourly Electrical Energy Output Using Support Vector Regression
Win Lei Myo Myat
Under the direction of Dr. Julie Clark

With constant growth in world's energy consumption rate, it is important to understand how efficiently a powerplant is producing, and to optimize the energy output. High profitability and contractual liabilities are greatly dependent on the accurate prediction of electrical power generation. In this project, support vector machine (SVM), a supervised learning model, is used to predict the hourly electrical energy output of a fully loaded power plant. The dataset consists of five variables: Temperature(T), Ambient Pressure(AP), Relative Humidity (RH), Exhaust Vacuum(V), and electrical energy output (EP). The hourly average values of each variable were obtained from various sensors located around the plant, and the data spans the six-year period of 2006 to 2011. Drop-in deviance tests are conducted to determine if each explanatory variable is important in the model. The proposed model is evaluated using the root-mean-squared error and compared with that of a linear regression model.

Department of Physics

Research Posters from First Year Seminar
Lasers, Nanoparticles, and Molecular Medicine

Nanoparticles to Infiltrate the Impervious Alzheimer's disease

Geneva Waynick and Udipta Bohara
Under the direction of Drs. Brian Gentry and Rebecca Beach

Alzheimer's disease is a progressive, neurodegenerative disease characterized by the degradation of the neurons and synapses in the brain caused by neurofibrillary tangles and plaques. The symptoms of the disease may manifest as loss of memory, degradation of judgement, and impaired cognitive abilities, thus increasing the dependence on people in a daily basis. Although many drugs have been developed to treat Alzheimer's disease, they have difficulty in passing the Blood Brain Barrier to reach the Central Nervous System, rendering the drugs largely ineffective. Traditional treatment for Alzheimer's include various kinds of drugs that reduce the symptoms of Alzheimer's and impede the progression of the disease. Even so, none of these drugs have been effective in their treatment satisfactorily. To assuage this limitation, the application of microbubble therapy in conjunction with nanoparticle technologies work together to open the Blood Brain Barrier and to deliver the drugs directly to the targeted areas. They can easily maneuver into parts of the brain which were less inaccessible before. Despite the fact that it is expensive, it is a promising treatment for an enigmatic disease.

Nanoparticle Use in the Treatment of Atopic Dermatitis with a Focus on Eczema

Alayna Pruitt and Paige Russell
Under the direction of Drs. Brian Gentry and Rebecca Beach

Atopic Eczema and Atopic Dermatitis affect a large percent of the populace, the majority of which are infants and young children. The conditions include itchy painful rashes, discoloration, uneven pigmentation, and a compromised immune system. The basic medical treatments in place for this condition are generally a type of topical corticosteroid ointment, often found to only be about 59% percent effective on patients during clinical trials and case studies across the United States. Along with the generally suggested corticosteroid creams, doctors also recommend lifestyle changes for patients, usually centering on avoiding any possible factors that might trigger an outbreak are also recommended. These methods are limited in their effectiveness, and do not completely treat the outbreaks but minimize and control them. New developments including silver and lactic-acid nanoparticle infused creams that work effectively on the subdermal layer, are being developed with a significantly higher success rate than those of the primarily used corticosteroid creams and ointments. These developing nanoparticulate technologies and treatments could change the approach in the treatment of these dermatologic conditions, and many more.

Targeted Motor and Sensory Reinnervation for Upper-Limb Amputations
Hannah Schmidt
Under the direction of Drs. Brian Gentry and Rebecca Beach

With over 1.7 million people in the United States living with limb amputations and thousands more experiencing limb loss per year, the field of prosthetic research is rapidly growing. Unfortunately, prosthetic limbs, especially those crafted for upper extremity amputees, are lacking functionality, in part because of the complexity of the system the prosthetic is supposed to mimic; coordinated motion is not granted to upper-limb amputees, though a new surgical procedure is revolutionizing the range of motion and dexterity patients are able to experience with their prosthetic. Targeted motor and sensory reinnervation (TMR) grants amputees previously unprecedented control with and of their prosthetic limb; the surgical procedure aims to "change the way the brain processes motor control and somatosensory input". In addition to the increased dexterity supported by the procedure, it also aims to reduce or remove neuroma pain to further increase long-term functionality of the myoelectric limb. The neuromuscular connections created by the procedure are connected to electrodes that externally connect with the new prosthetic limb. The electrical signals generated by the voluntary contractions of the muscle with the neuromuscular junctions allow the prosthetic to function simply by thinking. The energy that powers the prosthetic is still provided by an external power source.

Department of Psychology

Correlation between Morningness-Eveningness Chronotype and Seasonal Affective Disorder Score
Angelyanne Garcia and Kandyce Mayes
Under the direction of Dr. Bonnie Bowers

Some research has found that having an eveningness chronotype (delayed sleep period) is associated with having both non-seasonal depression and seasonal depression, i.e., seasonal affective disorder (SAD), although this result is not consistent across all studies. The present study was designed to replicate this association by giving participants the Morningness-Eveningness Questionnaire (MEQ) to determine chronotype score and the Structured Interview Guide to the Hamilton Depression Inventory, Self-rating Edition (SIGH-SAD-SR), which consists of the Hamilton Depression Inventory Subscale (HAM-D) and the Atypical Symptoms Subscale (ATYP). Sixty-eight participants from the Hollins University community took an online survey which contained these two measures. Because low scores are associated with eveningness on the MEQ, we predicted a negative relationship between MEQ and SIGH-SAD scores, and we expected that this association would be strongest with the depression subscale. The predicted relationships were not found, meaning that we did not replicate previous research findings.

Research Student Biographies 2018

Veronica Able-Thomas is currently a junior at Hollins University and will graduate in May 2019. She is majoring in chemistry with a concentration in biochemistry. She entered Hollins with a strong desire to pursue medicine but also developed a strong interest in scientific research after completing a research fellowship at the Virginia Tech Carillion Research Institute in Roanoke, Virginia, during the Summer of 2017. For her recent January term, she interned at a clinic in The Gambia, where she grew up. Veronica is considering pursuing an MD-PhD program after Hollins to combine her interests in research and treating patients in a clinical setting. Veronica enjoys sewing, traveling and playing table-tennis.

Rania Asif, class of 2019, is a Chemistry major with a Biochemistry concentration. During her sophomore year, she participated in a J-term internship at the Bradley Free Clinic. Rania is currently working on the independent study involving synthesis and analysis of inorganic ligands. She likes cooking spicy food, working out and shopping. Rania is currently a junior and she hopes to work as a Clinical Scientist researching and developing techniques to prevent illnesses.

Tasha Bestrom, class of 2018, is a double major in Biology (B.S.) and Environmental Science (B.S.). As a Horizon student, she entered Hollins with interests in both veterinary medicine and marine biology. The balance tipped towards marine biology after her first January term (2014), when Tasha participated in the Caribbean Ecology research course led by Drs. Renee Godard and Morgan Wilson. After serving as a TA for the course in 2017, Tasha decided to pursue graduate research in marine biology, and thus her senior honors thesis on the critically endangered Elkhorn Coral (*Acropora palmata*) was developed in collaboration with her research advisor, Renee Godard. Tasha is currently completing her last semester at Hollins as a student in the School for Field Studies Tropical Island Biodiversity Program in Panama, and she plans to enter a Ph.D. program in marine biology in 2019.

Angelyanne Garcia (left), class of 2018, is a Psychology major. Angelyanne currently lives in Arlington, VA and is going to pursue a career with counseling, but for now is taking a gap year before going back into school. She loves German Shepherds, reading romance novels, writing stories, taking photos of cars and working out in the gym. She has a passion for helping others, which led her to Psychology. Her dream is own an organization that helps veterans with disabilities with the help of horses and dogs to treat their physical injuries and mental disabilities as well. **Kandyce Mayes** (right), class of 2018, is a psychology major. Kandyce is originally from Norfolk Virginia but has plans to stay and work in Roanoke Virginia after graduation. She has always been intrigued with the human mind and reasons as to why humans behave in certain ways, thus leading to her interest in psychology. Her dream is to get involved in as many organizations as possible that are determined to help people through difficult times

Katlin Gott will graduate from Hollins University in May 2018 with a B.S. in Biology and a minor in Chemistry.

Katlin came to Hollins with the intent to pursue a major in biology and track toward graduate work in veterinary medicine. While working toward these goals, she also spent the spring term of her junior year in the Amazon rainforests of Peru with the School for Field Studies Center for Amazon Studies. Here, Katlin was able to combine her interests in ecology and animal disease by studying gut parasite loads in primates. Katlin will begin her DVM program at the Virginia-Maryland College of Veterinary Medicine in the fall of 2018.

Goma Karki, class of 2018, is an Environmental Science and Mathematics and Statistics double major. During her time at Hollins, she studied abroad in Cambodia via School for Field Studies, completed Honors Seminar Program and Certificate in Leadership Studies, Batten Leadership Institute. She also participated in a J-term internship at Climate center in New Jersey and American Rivers in Washington D.C. Goma will be perusing graduate program in Sustainability Science and Policy in Maastricht University in the Netherlands after graduating from Hollins University. She enjoys traveling, cooking and eating spicy food, decorating room, hiking, playing badminton, and watching comedy movies. This summer, Goma will be flying back to Nepal and traveling around Nepal.

Mary Hess, class of 2018, is a Mathematics major. During her time at Hollins she has participated in a J-term internship with ProDeal360, a real estate technology company. Mary took part in many abroad opportunities at Hollins including the Jamaica Cultural Immersion Program for two years and Hollins Abroad in London for over 3 months. Mary found a love for travelling and exploring while being abroad and hopes to continue this one day by living and working abroad in the future. She enjoys reading, listening to all types of music, and riding horses.

Catherine Kirkpatrick, class of 2019 is a double major in Biology (B.S.) and Environmental Science (B.S.). Her interests include marine biology, botany, and forest ecology. Her first research experience was participating in the Caribbean Ecology research course in St. John, USVI under Drs. Renee Godard and Morgan Wilson studying invasive seagrass. Catherine spent Summer 2017 working as a research assistant for Dr. Elizabeth Gleim studying the effects of the emerald ash borer on tree species diversity in southeast Virginia forests. She is currently spending her Spring semester studying abroad at the University of Limerick. After graduation, she plans on pursuing a Ph.D. in marine biology or forest ecology.

Gabrielle Lewis will graduate from Hollins University in May 2018 with a major in biology (B.S.) and a minor in chemistry. She entered Hollins as a transfer student with an interest in pursuing medical school. During her time at Hollins she has worked as an EMT and conducted research on brain cancer at Virginia Tech Carilion Research Institute. As a result of these experiences, Gabrielle has decided to pursue a career as a physician assistant. She feels that this path will provide more time for direct patient contact while also offering time to continue pursuing other interests. Gabrielle plans to enter a PA program in 2019.

Win Lei Myo Myat, class of 2018, is a Mathematics and Business major with concentrations in Data Science and Finance. She is passionate about statistical modellings and analyzing financial statements. During her time at Hollins she participated in J-term internships at YMCA of Roanoke Valley and John Wiley & Sons, a publishing company. She enjoys travelling, doing community service, listening to music, trying different cuisines, and being active outdoors.

Lan Nguyen, class of 2018, is a double major in Economics and Environmental Science. Lan came to Hollins with aspirations to pursue a business degree but she was quickly captivated by the bridge between economics and environmental issues. After spending her fall term her sophomore year in Cambodia studying fish biodiversity in freshwater ecosystems with the School for Field Studies Center for Conservation and Developmental Studies in the Lower Mekong and then completing a summer research fellowship at Woods Hole in her junior year, Lan developed a passion for work in marine ecosystem economics. Lan will begin her PhD program in Ecology, Evolution, Ecosystems and Society at Dartmouth College in the fall of 2018. (Her abilities were also recognized by admittance into 3 other prestigious graduate programs - Oregon State University, University of Wisconsin, and University of Maryland.)

Alayna Pruitt (right), class of 2021, is double majoring in Biology and Studio Art, and intends to pursue a medical career. In her free time she enjoys donating blood, working with horses and animals, and working on her new book. **Paige Russell** (left), class of 2021, is double majoring in Spanish and Environmental Studies. Her interests include learning about other cultures, creating art, and playing soccer.

Maya Sproelich, will graduate from Hollins University in May 2019 with a B.S. in both Biology and Chemistry with a biochemistry concentration. Maya came to Hollins with aspirations to pursue a biology degree and was quickly captivated by the connection between biology and chemistry. After spending her summer before junior year at INOVA Liver and Obesity Research lab she was captivated by the world of research and decided to investigate caves. During January of 2018 she started working with Dr. Carmichael to explore microbial communities and antibiotic resistance within caves. Maya is currently unsure of her plans after graduation but hopes to further her education by attending graduate school.

Hannah Schmidt, class of 2020, a Franklin County resident and recent Honors graduate of Franklin County High School, is completing her first year at Hollins University. Over the course of the next two years, she intends to complete a B.S. in Mathematics and continue to study Physics. She hopes to attend graduate school for biomedical engineering.

Sarah Struble, class of 2018, is a Chemistry major and Biology minor from Williamsburg, Virginia. During her time at Hollins, she has interned at the Roanoke Valley SPCA and had the opportunity to study abroad in both Ireland and Japan. Sarah was recently elected to the Hollins Chapter of Phi Beta Kappa. She enjoys reading, crocheting, and baking in her spare time. After graduation she plans to attend Eastern Virginia Medical School in Norfolk, Virginia for her MD

Samantha Viner, **Caitlyn Abare, Chelsea Alley, Ellie Bunten, & Jyoti Thapa**, are all in the Bio / ES 357L: *Conservation Biology Laboratory* where they completed this research. Jyoti & Samantha are in the class of 2021, Chelsea is in the class of 2019, and Ellie and Caitlyn will be graduating this spring. Jyoti will be double-majoring in International Relations & Environmental Science. Everyone else is an Environmental Science or Environmental Studies major. Chelsea ultimately hopes to go into science communications or something related to sustainable agriculture. Ellie plans to go on a cross-country trip after graduation and then plans to go into environmental education. Jyoti ultimately hopes to work for a non-profit organization to advocate for social and environmental causes. Caitlyn ultimately hopes to pursue a career in conservation and Samantha plans to pursue graduate work in botany or entomology.


Geneva Waynick (left) , class of 2021, is a first-year student from Mathews, Virginia. She is studying Chemistry at Hollins University, and is interested in medicine, specifically psychiatry. As a student in the First Year Seminar Lasers, Nanoparticles & Molecular Medicine, she and her partner gained deeper insight into current research in Alzheimer's treatment. **Udipta Bohara** (right), class of 2021, is an international student from Nepal where she completed her Cambridge A Levels coursework. She is currently leaning towards majoring in Biology or Mathematics and is very interested in pursuing biomedical research. In particular, she has a strong interest in new treatments for Alzheimer's disease. As a student in the First Year Seminar Lasers, Nanoparticles & Molecular Medicine, she and her partner gained deeper insight into current research in this field.